School choice in the light of the effectiveness differences of various types of public and private school in 19 OECD countries

Dronkers, J. and Robert, Peter
Maastricht Research School of Economics of Technology and Organization (METEOR), ELTE University

2005

SCHOOL CHOICE IN THE LIGHT OF THE EFFECTIVENES DIFFERENCES OF VARIOUS TYPES OF PUBLIC AND PRIVATE SCHOOLS IN 19 OECD COUNTRIES

J. Dronkers[1] & P. Robert[2]

Last revised: July 8, 2008

Word count (including tables, etc): 15.509

Abstract

The paper approaches the issue of school choice in an indirect manner by investigating the effectiveness of public, private government-dependent and private independent schools in 19 OECD countries selected from the PISA 2000 survey for this purpose. In a multi-level approach we estimate these sector-effects, controlling for sociological characteristics of students and parents, school composition, teaching and learning conditions of schools and students' and principals' perception of the climate of their schools. The main explanation of the gross differences in mathematical achievement is the better social composition of private schools, both government-dependent and independent, which is a clear consequence of school choice. But our analysis also reveals that private independent schools are less effective than public schools with the same students, parents and social composition, while that private dependent schools are more effective than comparable public schools. The explanation of these remaining net differences in mathematical achievement seems to be the better school climate of private

1 Address all correspondence to the first author: European University Institute, Via dei Roccettini, 9. 50014 San Domenico di Fiesole, Italy. E-mail: jaap.dronkers@eui.eu
2 Department of Sociology, ELTE University and TARKI RT - Social Research Center, Budaörsi út 45. H-1112 Budapest, Hungary. E-mail: robert@tarki.hu

dependent schools. The comparison concludes that these net differences in mathematical achievement between public and private school-sectors are equal across nations, despite the historical and legal variations in their educational systems and school choice approaches.

Keywords

school choice, school effectiveness, public versus private schools, cross-national comparison, secondary education

Introduction

The effectiveness of public and private schools has been the topic of a large number of studies in the educational sciences, sociology and economics, not only in the USA but also in Europe. In this literature, the distinction between public owned and funded schools, private but public funded schools (often religious schools) and private owned and funded schools, is especially important. Firstly, because in many countries these three types of schools exist alongside each other, especially in Europe where this was the unintended outcome of the 19th century struggle between the State and the Church(es).

Secondly, the functions of these three types of schools differ strongly, whether this be along social, cultural, religious or ethnic lines. Thirdly, the distinction between owned and public funded schools, and private but public funded schools, also relates to current policy debates about organizing and financing collective goods like education.

Although there are many exceptions, the general trend of this research on the effectiveness of private and public schools can be summarized as follows: private but public funded schools (often religious schools) are more effective in cognitive outcomes than public owned and public funded schools, even after controlling for social and cultural composition of these schools; private owned and private funded schools are less effective in cognitive outcomes than public owned and public funded schools, but only after controlling for the social and cultural composition of these schools.

Although the effectiveness of public and private schools is relevant for nearly all OECD countries, no comparative research has been conducted on the differences in the effectiveness of different types of schools. This lack of comparative research is partly due to the dominance of American research on this topic, and partly due to the strong nation-state orientation of the social sciences. Yet another contributing factor may be the political sensitivity of the possible lower effectiveness of public schools, especially in Europe. The only overview available is that provided by Dronkers (2004), who reviews the differences in effectiveness between religious state-funded schools and public schools in a number of single-country studies, including Belgium, France, Germany, Hungary, the Netherlands and Scotland.

There is, however, a need for comparative research because, in order to explain the cause of this difference in effectiveness between public and private schools, one must

have sufficient variation of various school characteristics. As this variation is often lacking within a single state, for example due to nation-wide regulations which restrict the range of variation between schools, single-country studies may fail to capture the 'real' effect of private and public schools. In an earlier article (Dronkers & Robert, 2008) we used the reading scores of individual students to analyze cross-nationally the effectiveness differences of private and public schools in 22 countries. We used in that article the same PISA 2000 data, as we will do in this paper, but have a different dependent variable. Their main finding is that the gross differences in reading achievement is the better social composition of private schools, both government-dependent and independent, which is a clear consequence of school choice. But their analysis also reveals that private independent schools are less effective in achieving high reading scores than public schools with the same students, parents and social composition, while that private dependent schools are more effective than comparable public schools. The explanation of these remaining net differences in reading achievement seems to be the better school climate of the private dependent schools. The comparison concludes that these net differences in reading achievement between public and private school-sectors are equal across nations. Corten & Dronkers (2006) addressed with the same PISA 2000 data but for 19 countries whether the slopes of the social background of the students vary between public, private goverment dependent and private independent schools. They found only a few differences in these slopes in relation to the social background of students. The few differences suggested that private schools did better for students from lower classes.

However, here we use the math score of the individual students in 19 PISA 2000 counties as dependent variable. A separate analysis of this math score in relate to private and public schools is necessary, while mathematical performance is more dependent of the school effectiveness and less of the parental capital. By using mathematical performance as dependent variable we have a lower risk to mix up school effects with unmeasured parental characteristics. Regarding our aims in this new analysis, first, we will attempt a systematic empirical test of the degree of effectiveness differences in mathematical performance of individual students in public and private secondary schools in 19 OECD countries, controlling for the characteristics of students and parents. Second, we will try to explain these differences in effectiveness according to the differing characteristics of schools. Third, we will test whether or not these differences in effectiveness are equal in the 19 OECD countries. Finally we discuss our results in the light of the choices between the school sectors we distinguished in our research.

Public schools, private independent schools and private government-dependent schools

As a consequence of the struggle between the church and the state within many European societies, modern private schools can have different relations with the state. The most fundamental aspect of this relationship is the degree to which private schools are funded by the (local, regional, national) government, alongside student fees, donations, sponsorships, and parental fundraising. In a number of societies, private schools have a

juridical right to funding by the state, provided they meet certain conditions. In some cases this right is enshrined in constitutional law (Germany, Netherlands), while in others this right is accorded by normal law (France, Hungary). This right of funding of private schools by the state also means a restriction of the autonomy of the funded private schools. Although these restrictions differ from society to society, and vary with the degree of state funding, one can say that, in general, this decreases the autonomy of these schools regarding their curriculum, mode of examination, payment of teachers and admission criteria of students. These private government-dependent schools can now be found in sufficient numbers in Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, Portugal, Spain, Sweden, Switzerland, and the USA (See Table 1).

Alongside these private government-dependent schools, there exist in a number of OECD countries private schools which do not get funding from the (local, regional, national) government. Financially, they are fully dependent on student fees, donations, sponsorships, and parental fundraising. However, their school autonomy can still be restricted in two ways. First, authorities might set criteria even for independent private schools in order to ensure some minimum quality of the socialization of the next generation. Second, even independent private schools function within a societal context and are partly determined by it. For example, entrance criteria for universities will restrict the autonomy of a private school's curriculum. However, private school autonomy will be largest in their student admission policies, especially given the importance of student fees for the financing of these schools. These private independent schools can now be

found in sufficient numbers in Austria, Belgium, France, Hungary, Ireland, Italy, New Zealand, Poland, Portugal, Spain, Switzerland, United Kingdom, and USA (See Table 1).

Given the different conditions for private independent and private government-dependent schools and their opportunities for competition with public schools, we will consequently distinguish between independent private schools, private government-dependent schools, and public schools. By doing so, we can test whether these two types of private schools are simply interchangeable forms of private schools, as argued by Vandenberghe & Robin (2004) in their analyses of the same PISA data. Furthermore we can also analyze whether these two types of private schools appear as different options from the viewpoint of school choice.

We acknowledge that this distinction between public, private government dependent and private independent schools is still crude. Especially the history and the evolution of these various types can be quite different in the various societies: church versus market oriented; one church versus various churches oriented; strong versus weak connection with various political parties; strongly contested versus broadly accepted; recent growth versus a long-standing existence. Also their actual constitutional arrangements will be quite different: based upon constitutional right versus policy agreement; a strong versus weak control by state authorities. Therefore, it is important to control for the effectiveness of the various conditions of teaching and learning, like teaching and material resources and degree of school autonomy, as we will do. For that reason we will also test whether these differences in effectiveness are equal in the various countries. It might be possible that public, private government dependent and private

independent schools have the same function in modern society, despite the different history and constitutional arrangements.

Public and private schools have to operate in these nations under different conditions, both financial and educational. Also the school choice processes and their degree of freedom will be different in these countries (both legally and in practice). In the vast majority of these countries private dependent schools can be characterized as chartered, non-district schools or 'pure' universal tuition voucher, non-district schools (Merrifield, 2007). The other types of school choice (tuition tax credits; targeted vouchers) do not exist in these countries or are irrelevant for the private – public distinction, because all schools get them (for instance extra money for private dependent and private schools with high percentages of immigrant pupils in the Netherlands and France). Also in the vast majority of these countries public school get the same or even more financial support by the state, but they are more often district bound in their recruitment of pupils (this is more true for the French but less for the Dutch public schools, and that can even vary between municipalities in these countries).

Possible explanations of effectiveness differences between public and private schools

The literature on the possible causes of effectiveness differences between schools is extensive. Since we cannot review it here in its complexity, we draw on the most recent overviews (Sammons, Hillman & Mortimore, 1995; Scheerens & Bosker 1997; Teddlie & Reynolds 2000). Thus, for example, Coleman, Hoffer and Kilgore (1982) analysed the effectiveness differences between public and catholic schools in the USA, with Coleman

and Hoffer (1987) and Bryk, Lee and Holland (1993) providing comprehensive follow-up studies of these same differences. Dronkers (2004), meanwhile, reviewed the empirical evidence of effectiveness differences between public, catholic and protestant schools in Europe. Below, we will summarise only the most debated causes of these differences, as a subsequent basis for selecting the relevant variables on students, parents and schools for analysing and interpret them.

Differences in student characteristics and in school composition

Given the higher probability that private schools will ask fees from parents, the social background of students in private and public schools will vary, especially in terms of the occupational, educational and financial characteristics of both parents. Consequently, more students from a more favourable background will go to private schools, which in turn might improve the social composition of the school population. More students of a favourable background will increase the opportunities of reaching higher levels of scholastic achievement, both as a result of a higher level at the start of secondary school, the better teaching and learning conditions (especially more teaching, due to a lower level of non-academic disturbances), and more possibilities to match pupils with a specific curriculum, pedagogy and teachers. This will promote a potentially better reputation of academic quality for private schools in comparison to public schools, thus attracting different students. We will try to control for as many social background characteristics as possible, as well as the social composition of the student body of schools.

Deliberate school choice

Closely related to the reputation of academic quality of private schools is the argument of a deliberate educational choice. A deliberate choice for an 'unconventional' school (as compared to a 'traditional' choice for a common school) will increase the possibility of this 'unconventional' school becoming a community in which students perform better. Depending on a deliberate educational choice, and the self-selection following on from such a choice, both private and public schools can become a community of shared values and dense social ties which can affect student achievement. Given the fact that in most of the 19 OECD countries we will analyse (except for Belgium, Ireland, and the Netherlands) public schools are the most common, private schools will be the deliberately chosen ones. Parents, students and teachers of deliberately chosen schools will expect more efforts from each other, will tend to form a community of shared values and dense social ties, and will generally be more ready to help the school. We will try to control for the causes of these effects of deliberate choice of school by controlling for the academic and cultural interests, resources, attitudes and behaviours of parents and students.

Different conditions for teaching, learning and school administration

Public and private schools differ in their administrations and conditions for teaching and learning. While public schools are fully dependent on the state for their finances and their administration, private schools depend more on student fees and private charity, and only occasionally on the state for additional support. It is not self evident that private schools have the optimal conditions compared to public school (for instance the student/teacher ratio), but differences in these conditions might influence effectiveness. There is also a variation in educational administration between public and private schools (Hofman, 1993) and this can also help explain some of the differences in educational performance. These differences refer less to the formal differences in educational administration but more to the tendency for stronger informal relations between governing school-board and teachers in private schools, which may partly explain the better performance of their pupils. We will try to control for these differences in administration, learning and teaching conditions by controlling for various aspects of the school characteristics.

Different school climates

Given the possible differences in students, parents, social composition of the school population, school administration and conditions for teaching and learning between public and private schools, different patterns of behaviour from teachers and students might develop. These different behavioural patterns will promote more or less shared beliefs about what students should learn, about the proper norms of instruction, and how student and teachers should relate to each other. These patterns, which form the basis of a school climate, might affect the effectiveness of teaching and learning within these

schools. These patterns may also affect teacher morale, which can also influence teaching effectiveness. We will try to control for these differences in school climate by controlling for various indicators of the behaviour of teachers and students.

Stronger core curriculum

Public and private schools can differ in the strength of the core curriculum they offer to their students, regardless of their personal background or future educational plans. A strong core curriculum integrates the structure and policy of schools, not only for students but also for teachers. Private schools tend to have a more limited differentiation in their curriculum compared to public schools. This limitation in curricular differentiation can be partly the consequence of the smaller school size and the more limited resources of private schools, due to their (partial) dependence on non-governmental funds. However, the limitation in curricular differentiation can also be the consequence of long-standing traditions about what constitutes a proper education. Religious schools in particular (Jewish, Catholic or Protestant) can draw on such old traditions to shape their curriculum, thus avoiding strong curricular differentiation, even if the religious inspiration has been weakened. This limited differentiation in the curriculum of private schools can be a strength, because it allows less a move to a less challenging stream or differentiation. Unfortunately, we cannot control directly for these differences in core curriculum (although we try indirectly by the amount of time dedicated to reading and mathematics), because the PISA data contains hardly any of the relevant indicators. Nevertheless, it is important to keep this factor in mind.

Use of PISA data and measures

Data

Our analysis is based on the PISA 2000 survey organized by the OECD, under the project title *The OECD Programme for International Student Assessment*. This research aimed to provide internationally comparable evidence on the performance of 15-year-old students in all the OECD countries. The data-file used for the empirical analysis is exactly the same, which the OECD has made available on the Internet for the purpose of secondary analysis.[1] The database comprises data collected in 2000 in 32 countries. In addition to the original variables derived from the survey, OECD researchers have developed numerous aggregated measures based on students' and school principals' responses, and these variables were also added to the dataset. Information on these aggregated measures is available from the *Manual for the PISA 2000 Database* as well as from the *PISA 2000 Technical Report*, including their reliability and internal consistency. We decided to use these broadly accepted measures and arrange them into sociologically meaningful groups for estimating student achievement and the characteristics of their parents and schools, rather than developing our own (potentially more contestable) indicators.

The strength of the PISA 2000 data is its cross-national comparability. The OECD/CERI has developed scheme to compare the outcomes of various educational systems by making use of the experiences of earlier efforts to compare cross-nationally educational results (AERA; TIMMS). By using a multilateral approach to develop this scheme, it has avoided a one-sided measurement and its results are widely recognized throughout the OECD countries. Although one can doubt whether the PISA indicators

cover all particularities of the education systems of each analyzed country, they are the most reliable and valid data for a cross-national comparison across a large number of modern societies. A weakness of the PISA 2000 data is the cross-sectional nature of the collected data. It is a one-moment picture of the 15-year-old students: we do not know anything about their further development, neither about their earlier education experiences and outcomes. It is widely recognized that a longitudinal measurement of educational outcomes in relation to school characteristics is superior to a cross-sectional measurement, because longitudinal data allows better to control for unmeasured variables and (self-)selection. Unfortunately such a cross-national and longitudinal data set is not available and will probably not available in the coming years. Moreover we know from the history of the study of school effectiveness that the higher effectiveness of non-public schools is lower in longitudinal data, but that the direction of the results is equal to those obtained with cross-sectional data. (for instance the analogy between the outcomes of Coleman, Hoffer and Kilgore (1982) using cross-sectional data and those of Coleman and Hoffer (1987), using longitudinal data) Therefore, we think that an analysis of these special cross-sectional data is worthwhile and scientifically interesting.

Another weakness of the PISA data can be the measurement of the school characteristics. Most are based on the answers of the principals (like teacher and student misbehavior, teacher morale) and others are based on the pupils' answers (achievement pressure, teacher-student relationship, sense of belonging to school). One would prefer to have comparable measurements of the school characteristics, given by both principals, teachers, pupils and parents. But they are not available in the PISA data (only principals and pupils are questioned). However, we do not believe that pupils or principals answers

to questions on school characteristics are a priory less invalid as the answers of teachers or parents.

Private and public schools.

For the purpose of this paper, for studying effectiveness of public and private schools in a comparative perspective, we have selected a certain number of countries to be included in the analysis. The selection was based on choosing those countries where both the public and private sectors of education are developed, and which represent a wide range of different types of societies from different regions. We also distinguish between private independent schools and private government-dependent schools. This division was developed earlier by the OECD, was applied by the PISA survey and it shows up in many discussions about the various forms of private and public schools and school choice (Merrifield, 2007). The schools are classified as either public or private solely according to whether a public agency or a private entity has the ultimate power to make decisions concerning the institution's affairs. An institution is classified as public if it is (1) controlled and managed directly by a public education authority or agency or, (2) is controlled and managed either by a government agency directly or by a governing body (Council, Committee etc.), most of whose members are appointed by a public authority or elected by public franchise. In contrast, an institution is classified as private if it is controlled and managed by a non-governmental organization (for example a Church, Trade Union or business enterprise), or if its Governing Board consists mostly of members not selected by a public agency. The terms "government-dependent" and "independent" refer only to the degree of a private school's dependence on funding from

government sources; they do not refer to the degree of government direction or regulation. A government-dependent private school is one that receives more than 50 per cent of its core funding from government agencies. An independent private school is one that receives less than 50 per cent of its core funding from government agencies. "Core funding" refers to the funds that support the basic educational services of the schools. It does not include funds provided specifically for research projects, payments for services purchased or contracted by private organisations, or fees and subsidies received for ancillary services, such as lodging and meals. Government-dependent private schools can thus include chartered schools in the USA, state granted religious schools in many European societies, but also state granted schools with a particular didactic concept like Montessori. Government independent private schools can thus include religious schools in the USA, religious schools in some European societies, but also schools with a particular didactic or philosophical concept like Anthroposophy (like the Walddorf schools in Germany). The PISA data don't allow us to make these distinctions within the private school sectors.[2]

The countries we have selected are, in alphabetical order, Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Netherlands, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the USA. These countries have enough absolute numbers of students with a valid math score (see section data preparation) attending a form of private school in the PISA data for reliable estimates of effectiveness to be made (See Table 1 for our final data set).

Data preparation

We use the unweighted data, because we are interested in the 'quasi-experimental' effect that being a student in a private or public school has on educational results. From this perspective, each country is an 'experimental' case, which should not be reweighted because of its population size. Such a reweighting with real student population sizes for each country would produce an unbalanced result, in which countries with the highest student populations (and thus with certain types of public and private schools) would dominate the results, while countries with small student populations (and thus with certain types of public and private schools) would have a smaller effect on the outcomes. An analysis with reweighted data would, therefore, produce invalid estimates of the effectiveness of the various public and private schools. For this reason, the analysis sticks to the original number of cases, with some corrections for very small schools (see below). Fortunately, the sample-size in the various countries did not vary too much, allowing us to treat countries under more or less equal 'experimental' conditions, and without deleting cases.

In addition to the selection of countries, we also follow a selection procedure with respect to schools and students, and include only those students for whom the basic information on gender, school grade, valid score of achievement (the dependent variables), on type of school as described above, location of school, and family type was available. In the case of the other independent variables, if missing cases occurred in the data, these were replaced by the mean value of the variable. We deleted also all schools with less than 11 pupils who also participated in the math test (see next section dependent variable), because too many schools with very low numbers of students could jeopardize

the reliable estimation of the effectiveness of these schools. This deletion may lead to a bias towards sectors with larger schools, but we prefer this bias to unstable or unreliable estimates of school effects. As a consequence of this deletion of small schools in some countries all private schools were dropped. For instance United Kingdom has also private dependent schools, but less that 11 pupils in each of these participating schools filled in the math test and thus these schools are dropped.

Variables

Dependent variable.

The PISA 2000 survey contained focused primarily on students' reading. Mathematics and science abilities were of secondary importance in PISA 2000.[3] For this analysis, we use only one of the three possible dependent variables on students' performance: we will use the maths scores as dependent variable in the analysis.[4] The maths scale aims to measure the ability of students with respect to interpreting and translating problems into a mathematical context, using mathematical knowledge to solve problems, and interpreting and communicating their results, again based on various tasks. An advantage of the math scale is that it is of less cultural but of more cognitive character. The math performance, like all other performance measures in PISA, was constructed by applying weighted maximum likelihood estimates (Warm 1985) and was translated into scales with a mean of 500 and a standard deviation of 100. In addition, the PISA file contains measurement error variables for all ability estimations, also for math. We will include this error term variable in our analysis to control for the possible measurement error of the math performance variable.

However the math score was not measured for all students in PISA 2000 (contrary to the reading score). Only the half of the participating students had also to fill in the math test. As a consequence per school we have less pupils as in our reading analysis (Dronkers & Robert, 2008). This selection of students filling in the math test was done ad-randomly.

Sociological and demographic characteristics of students and parents.

Most of the independent variables used to predict students' achievement are combined indices, developed by PISA. These were also constructed by applying weighted maximum likelihood estimates (Warm 1985) and were standardized in such a way as to have a mean of 0 and a standard deviation of 1 at the international level of all countries. The first set of independent variables involves students' as well as their parents' social and demographic characteristics. We will differentiate between males and females in the analysis. Despite a slight variation, we will control for *school grade* and *age* (measured in months in the data).[5] In keeping with established traditions of social mobility and status attainment research, we will include *father's and mother's occupation and education* as indicators of social origin. Occupation is measured in the data by the international socio-economic index (ISEI) (Ganzeboom *et al*. 1992), while education is measured by the ISCED scale (OECD 1999). Further information on family background is *number of siblings,* as well as *family structure* which distinguishes between nuclear families, single parent families and other family constructions. The cultural climate of the family is expected to be an important factor of students' performance. In this regard, the PISA survey provides information on how frequently parents discuss political and social issues,

books, films, and television-programs with their offspring. PISA has combined these individual items into an index labeled *Parents' academic interest.* Similarly, students were asked to report on how frequently parents discuss school issues with them, eat together with them around the table or spend time talking to them at all. PISA combines these variables in an index labeled *Parents' social interest.* Obviously, students' personal cultural participation is also part of this climate. The survey included questions on visiting museums, art galleries, going to the theatre, classical music concerts, or ballet. As previous research provides evidence of the effect of high cultural participation on school achievement (for example DiMaggio 1982), we included the combined scale score on *Students' cultural activities* in our analysis. In line with studies on cultural capital (Bourdieu 1983), possession-related classical culture contributes to the cultural level of the family. The PISA index on *Family cultural possession* is based on having classical literature, books of poetry, works of art at home. In addition to cultural possessions, financial capital can also be of importance for educational outcomes. As a direct measure of parental income is quite unreliable given that it is the students in the school who report on it, a *Family wealth* index has been constructed based on the presence of dishwasher, television, cellular phone, motor car, computer, and a link to the internet at home. Since the research aims to explore the predictors of students' performance, we need to control for students' educational circumstances at home. This is measured by the PISA index labeled as *Home educational resources*, and considers whether or not the student has a desk, a quiet place for study at home, and if the family has dictionary, textbooks, and calculators. Finally, it probably also matters whether parents work with student on their

schoolwork and help them to do their homework. The frequency of these events, as reported by the students, is measured by the *Family educational support* index.

Behavioral and attitudinal characteristics of students and parents.

The behavioral and attitudinal characteristics of students and parents related to education and school is the next set of independent variables. Students were asked to report how much time they spend on doing their homework for languages, mathematics and science. The index for *Time spent on homework* is based on these three pieces of information. The PISA survey collected information on attitudes towards the school and teacher behavior. Students were asked to report on how much interest teachers show in their learning progress, how frequently teachers let them to express their own opinion in school or how frequently teachers help them to understand school materials. Our *Teacher support index* is based on these items. Further questions were asked about how well students get along with teachers, how much teachers are interested in students, how much they listen to what students have to say, and how fairly they treat students. PISA combined these questions in the *Teacher-student relationship* index. Students' performance is affected by the general climate in the school and in the class. It matters if the teacher has to wait until students sit down quietly at the beginning of the class, if students do not start to work when the class begins, if students do not listen to what teacher says, and if there is noise or disorder during the class. The *School disciplinary climate* index is based on students' responses to these questions. Another aspect to be considered is how much the teacher wants students to work hard, how much he/she tells them they can work better, how much he/she dislikes if students do not work well. Students' responses to these questions

are combined in the *Achievement pressure* index. An overall indicator of the student-school relationship emerges from the questions on how much the student feels himself/herself as an outsider in the school or feels awkward in the place, how easily he/she can make friends there, how much he/she feels liked by the other students, or how lonely he/she feels. The PISA index entitled *Sense of belonging in the school* provides combined information on this.

As part of the behavioral and attitudinal characteristics, the PISA study puts a large emphasis on reading habits. A series of items were devoted to students' attitudes on whether or not they like to read, enjoy going to a bookstore or library, feel happy if receiving a book as a gift, and if they like talking about books with other people. Or, on the contrary, whether he/she feels reading is a waste of time, reads only to get information, or finds it hard to finish a book. The *Enjoyment of reading* index is based on the answers given by students. The *Reading diversity* index summarizes students' reports on how often they read magazines, comics, fiction or non-fiction books, emails and newspapers. Finally, two further simple indicators are considered for student performance which measure the time in terms of *number of minutes spent each week at school reading and in maths classes.*

School composition.

Since the intention of this analysis is to compare students' performance in different kind of public and private schools, we must control for the social composition of the school population in order to avoid biased measuring in evaluating the effectiveness of these types of schools. In order to achieve this goal, we compute three aggregated variables

from individual students' characteristics: the *school average of father's occupational status* (ISEI), the *school average of family's wealth* and the *school average of parents' academic interest*. These three aggregated indices of school compositions cover the three most important dimensions of inequality in school composition (financial; occupation; cultural). Adding more aggregated indices does not change our results.

The next indicator of school composition is the *proportion of girls* in the school. Finally a series of variables indicates the *place of residence* for the student ranging from small settlements (inhabitants less than 3000) up to capital city, is included in the analysis.

Teaching and learning conditions.

Indicators for the teaching and learning conditions in schools are also considered as variables in the analysis of differences in effectiveness. This type of information was provided in the PISA survey by school principals. The first indicator of this kind is *school size,* measured by the number of students in the school. Principals were also asked to report on the number of teaching weeks per year, the number of class periods per week, and the number of teaching minutes per class; the variable *Hours of schooling per year* summarizes this information. There is a widespread belief that availability of high-tech devices improves students' achievement in the school. In order to test this assumption, we included one measure with respect to high-tech infrastructure from the PISA data, namely the *Number of computers per student per school*, measured as the ratio of the total number of computers to the total number of students in the school. The availability of "human capital" in the school is another factor which may affect students'

performance. We use one "rough" indicator to measure conditions in the school in this respect, and this is the *Student – teacher ratio*, where the total number of students is divided by the total number of teachers in the school. We also include further indices in the analysis, based on additional information from school principals on the conditions in the school. Thus, the *Schools' instructional resources* score is based on the principals' reports on the availability or lack of teaching materials, multi-media resources, science laboratory equipment and facilities for fine art education. Furthermore, the *Schools' material resources* index draws on the principals' reports on physical infrastructure, in other words the condition of the school buildings, the quality of the heating, cooling and lighting systems, and the availability or lack of space (for example classrooms) in the school. In addition, and with respect to human capital resources in the school, principals' views were elicited on the shortage of teachers in general, and in particular in the case of languages, mathematics and sciences. This information is summarized in the index of *Shortage of teachers.*

Finally, autonomy also denotes a crucial part of teaching and learning conditions in the school, and may have an influence on students' achievement. The *School autonomy* index is derived from a number of questions to which school principals were asked to state whether or not different activities, like hiring / firing teachers, deciding about teachers' salaries and its increases, about the school budget, about students' admission to the school, about choosing textbooks, offering courses, determining the content of the courses, are the responsibilities of the school or not. In a next step, principals reported on whether or not teachers can take part in the kind of activities

mentioned above. These answers served as a basis for the *Teacher autonomy index*, an indicator of teachers' participation in decision making.

School climate.

School climate represents a final set of school related variables which can influence student performance and thus explain differences in effectiveness. The PISA survey asked school principals to express their general perceptions of both teacher-related and student-related factors affecting the school climate. Teacher related factors include high or low expectations of the teachers towards their students, teacher absenteeism, frequency of changes in the teaching staff, teachers' encouragement of students to achieve better, or strictness with the students. Student related factors include student absenteeism, disruption of or skipping of classes, lack of respect for teachers, use of alcohol or drugs, and the intimidation of other students. These indicators are combined into two indices labeled *Teacher misbehavior* and *Student misbehavior*. Finally, the *Teacher morale index* expresses principals' perceptions of teachers' morale, enthusiasm, on how much they take pride in the school and how much they value academic achievement.

Descriptive results

Dependent variable.

We have produced three descriptive tables in order to provide a general view of the basic features of the PISA data. Table 1 shows the means and standard deviations our dependent variable, the math score as well as for its error term, by type of school. The

data shows that the mathematical scores are significantly higher in the two types of private schools as compared to the public schools, indicating the higher achievement of students in private sector of education. In other words, according to the PISA data, it appears that students in private independent schools perform somewhat better. At the same time, however, the standard deviation of students' performance is smaller in private schools than in public schools. The measurement error for math seems also slightly bigger in public schools with higher standard deviation, as well.

Private and public schools.

Table 2 shows the distribution of the types of schools in the 19 countries included in the analysis, after deleting those schools with less than 11 old pupils with a valid math score. On average, more than 80% of the students analyzed here attend public schools, about 15-16% of them study in private government-dependent schools, while only about 3% attend private independent schools.[6] A strong deviation from this pattern can be seen in Belgium and the Netherlands where only one-fourth of the students attend public schools. The equivalent proportion is one-third in Ireland and two-thirds in Spain. In Belgium and in the Netherlands about 75% of students attend private government-dependent schools. The same proportion in Ireland is about 60%, nearly 30% in Spain, whereas one-fifth of students attend such schools in Denmark. The percentage of students in private independent schools is the highest (around 8%) in Spain and France.

While there are only a few countries where public secondary schools are much less attended, there are several countries where more than 90% of students study in these schools instead of in private institutions. The former socialist countries (the Czech

Republic, Hungary, Poland), the Scandinavian countries (Finland, Sweden) and Anglo-Saxon countries (New Zealand, the United Kingdom and the USA) belong to these cases. In addition, we also find Germany, Portugal and Switzerland in this group of countries. Indeed, the private independent secondary schools seem to be non-existent in the educational systems of the Czech Republic, the Scandinavian countries (Denmark, Finland, Sweden), Germany and the Netherlands. Furthermore, this type of private school also seems to play a marginal role in secondary schooling in Belgium, Hungary, Poland and Portugal. Private government-dependent educational institutions are missing in New Zealand, Poland and the United Kingdom (in the latter case due to the deletion of small schools). They also seem to play an especially marginal role (around 3% or less of students) in Italy, Finland, Sweden, Switzerland and the USA.[7]

Sociological and demographic characteristics of students and parents.

Turning to the independent variables, Table 3a displays means for students' and parents' characteristics. With respect to gender, significantly less boys study in private government-dependent schools. Our data refer to students attending, on average, slightly higher grades in the private independent institutions; consequently, they are also somewhat older. The classic indicators of social origin - father's and mother's occupation and education - show that students in public schools come from a significantly lower family background. The regular nuclear family background with both parents characterizes significantly less students in public schools, with a higher proportion of students from these institutions living in mixed families. Also, significantly less students live in one-parent families in private government-dependent schools.

With respect to the cultural capital indicators, students in public schools live in families where both cultural and social communication is less frequent compared to the family climate of students in private independent schools. The same holds for students' own cultural participation. In addition, the cultural possession, family wealth and home educational resources indices are also the highest for these students. In contrast to public schools, both the cultural possession and family educational support indices are significantly lower for students in private government-dependent schools.

Behavioral and attitudinal characteristics of student and parents.

Table 3b displays the behavioral and attitudinal characteristics of students and parents related to education and schools. The first indicator in this respect shows that students in private independent schools spend the most time on homework. Teachers seem to express more interest in students in these schools, and the teacher-student relationship index scores the highest, which indicates a better match of pupils to the curriculum, pedagogy and teachers. The school disciplinary climate, however, is the lowest in these institutions. Students in private government-dependent schools report less support from their teachers, but also less achievement pressure in comparison to student reports in independent private schools. Achievement pressure is also the highest in independent private schools. Both measures of reading (enjoyment and diversity) are the highest for the latter category, while they are the lowest for students in private government-dependent schools. Students in private independent schools spend the most time reading and in maths classes.

Social composition of schools.

Table 3c gives information on the social composition of schools. Girls are significantly underrepresented in private independent schools and are significantly overrepresented in private government-dependent schools. Public schools have the lowest averages of family background characteristics. The school average of father's social status is the highest for private independent schools; the same holds for the school average in family wealth. The private government-dependent schools are only slightly better in this respect, in comparison to public schools. Interestingly, pupils in private independent schools report both the most intensive cultural communication and parental academic interest. This index scores the lowest for the private government-dependent schools. In comparison to public schools, private independent schools can be found more frequently in larger cities, while private government-dependent schools are mostly located in middle-sized settlements.

Teaching and learning conditions.

Teaching and learning conditions are presented in Table 3d. In comparison to public schools, the school size is significantly larger in private government-dependent schools and smaller in private independent schools. The total schooling hours per year is the highest in government-dependent private schools, followed by private independent schools. The number of students per teacher is significantly higher in private schools in comparison to public schools. Despite this quantitative difference, however, the more qualitative measure indicates less of a shortage of teachers for languages, mathematics or sciences in the private schools, especially in the independent ones. According to the

evaluation of the school principals, teaching resources are worse in the private schools, especially in the independent ones; the same pattern can also be observed for the material resources. The total number of computers per school size is also the lowest in private government-dependent institutions. However, the situation is to the contrary when autonomy in schools is considered. According to principals' reports, the degree of school autonomy is lower in public institutions; the same also holds for teachers' participation in decision making. It is, of course, possible that the principals of private schools had some higher criteria in mind in comparison to the principals of public schools. But it is more likely that these differences can be explained by funding differences between public and private dependent schools. In some nations private dependent schools are only partly funded by their states or not all educational resources are fully subsidized. In some nations private dependent school can ask parents for a fee, while in other states this is forbidden. The variation in funding differences between public and private dependent schools between the studied nations is substantial, but all private dependent schools get more than 50 per cent of its core funding from government agencies, while the private independent schools get less than 50 per cent of its core funding from government agencies.

School climate.

The last set of school-level measures in Table 3e shows further indicators of school climate. Principals evaluate the misbehavior of both the teacher and of the students to be more frequent in public schools. Teacher morale, on the other hand, is perceived to be higher in private schools, especially in the independent ones.

Controls or explanations?

Some of these characteristics and indicators of schools, like teaching and learning conditions or school climate, can also be considered as possible (intermediary) outcomes of the differences between public and private schools, and are not only control variables, such as students' and parents' characteristics or social composition of the school. School choice and parental role in these decisions play crucial role in the background of these differences. Therefore, we will treat them as intermediary outcomes by adding them in special steps into the further analysis, thus separating them from the more demographic and sociological variables and the school composition indicator. The reader can decide which step in the analysis is the correct one in assessing the differences in effectiveness between public and private schools. However, we believe that these intermediary variables, important as they are, should not be the final dependent variables of school effectiveness analyses. Real acquired knowledge and skills like math performance in our case are more appropriate final indicators of school effectiveness, while school climate, learning and teaching conditions or behavioral and attitudinal characteristics of parents and students are only instruments to reach these final goals of schooling, namely knowledge and skills.

Multi-level analyses

Nested multilevel models.

We use multi-level analyses (MlwiN 1.1, Rasbash *et al*. 2000) with four levels: 1. Test: mathematical outcomes as dependent variables and the standard deviations of the error of the math score; 2. Students: student and parent characteristics as control variables; 3. Schools: government-dependent private schools and private independent schools as two dummy variables and public schools as the omitted reference category; other school characteristics, including social composition as control variables but also degree of freedom of action at the school level as variables to explain effectiveness differences; 4. Country: no specific variables.

We start with an empty zero-model with four levels: test, students, schools, and countries. At the lowest level we have the weighted likelihood estimates for mathematics as the dependent variable and the standard deviation of the error of this estimate. The variance at the lowest level is fixed at 1.00. This results in a measurement model of the next level of the students (see Hox, 2002). It gives a more reliable estimation of the true score of the students because the model takes the measured error into account.

Model 1 is an extension of this empty zero-model: we add two dummy variables to the equation at the school level: private government-dependent schools ('private dependent') and private independent schools ('private independent'). Public schools act as the omitted reference category. The parameters of both dummies indicate to which degree students within these two types of schools have higher or lower scores on the math tests.

Model 2 is an extension of model 1: we add all of the sociological and demographic characteristics of the students and their parents at the student level to the equation. If differences in the math scores between students from private independent,

private government-dependent and public schools are caused by the differences in the sociological and demographic characteristics of the students and their parents, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

Model 3 is an extension of model 2: we add the behavioral and attitudinal characteristics of students and parents related to education and schools to the equation at the student level. If differences in the math scores between students from private independent, private government-dependent and public schools remain significant, one can conclude that the measured characteristics of the students and their parents are not a sufficient explanation of the differences in mathematical performance between students from private independent, private government-dependent and public schools. The results of model 3 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the characteristics that individual students and their parents bring to their private and public schools, or develop while attending these schools.

Model 4 is an extension of model 3: we add the social composition of the school-population at the school level to the equation. If differences in the math scores between students from private independent, private government-dependent and public schools are caused by differences in the social composition of the school-population, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant. The results of model 4 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the compositional school

characteristics, resulting from the aggregate choices of the individual students and parents.

Model 5 is an extension of model 4: we add the variables which are indicators of the teaching and learning conditions in schools to the equation. If differences in the math scores between students from private independent, private government-dependent and public schools are caused by differences in the teaching and learning conditions in schools, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

Model 6 is an extension of model 5: we add the variables which are indicators of school climate to the equation. If differences in the math scores between students from private independent, private government-dependent and public schools are caused by differences in school climate, the parameters of the dummies 'private independent' and 'private dependent' should become insignificant.

The results of models 5 and 6 can be interpreted as possible explanations of the possible higher effectiveness of private schools, given the characteristics individual students and their parents bring to their private and public schools or gain by the compositional school characteristics, and which result from the aggregate of school choices of students and parents. They open partly the 'black box' of the likely causes of the higher effectiveness of certain schools, which is not related to individual features or compositional effects, but can be considered as the 'real' added value of schools. However, on can maintain that these included teaching and learning conditions and the school climate variables of the models 5 and 6 are not fully measuring the characteristics

of private schools (for instance their unique pedagogy, other types of school choice). But the current PISA data do not contain valid indicators for these characteristics.

Estimates for these models 0-6 appear in Table 4a.

All these models assume that the parameters of the dummies 'private independent' and 'private dependent' are fixed at the country-level. This means that these effects are estimated with the assumption that they do not vary significantly between the 19 countries. However, if the parameters of the dummies 'private independent' and 'private dependent' at the country level happen to be significantly random, then the differences in the math scores between students from private independent, private government-dependent and public schools are not true for a significant number of countries. We test for this possibility of random variance of the slope of the dummies 'private independent' and 'private dependent' in all models independently and separately, and the results are reported in Table 4b. Finally, Tables 4b gives the relation between the slope of the relevant dummy and the level of the intercept of that model, which allows us to see whether the variations of the slope of the dummy can be explained by a bottom or a ceiling effect. A significant relationship between the slope of the relevant dummy and the level of the intercept indicates that slope and intercept are not independent. A positive relation suggests a bottom effect: the slope of this school variable is higher if the intercept of that school is higher, while a negative relation suggests a ceiling effect: the slope of this school variable is higher if the intercept of that school is lower. We test only the significance of the slope of the dummies 'private independent' and 'private dependent' at the country level, but not the significance of the variances of the slopes of other independent variables, because that is not the topic of this paper. We do not test

either the significance of the slope of the dummies ‘private independent’ and ‘private dependent’ at the school level, because that would only test whether the effect of these schools within countries varies and not whether this effect varies between countries.

Model 0: variances at student, school and country level.

The zero-model shows the amount of variance at the different levels of student, school and country. As always, the greatest amount of variance of the dependent variables is at the student level (56%), followed by the school level (33%) and the country level (11%). However, the variance at all levels is significant and must be explained. The changes in the amount of remaining variances at the different levels in the different models illustrate that the independent variables do explain a substantial part of these variances. The variance at the individual level declines by 22% for the math scores (2905 to 2267). The decline of the remaining variance at the school level is even stronger between model 0 and model 6: it is 70% (from 1717 to 516). However, the change of the remaining variance at the country level has an inverted U-form. It increases strongly up to model 2 (from 556 to 780) and then declines slowly until model 6 to a level above model 0 (680). This strong increase of the remaining variance occurs in model 2, where the sociological and demographic characteristics of the students and their parents are added to the equation at the student level. Such an increase in the remaining variance at a higher level is not strange if important variables are included in a multi-level equation at a lower level. Nevertheless, such increases indicate that differences in the dependent variables have been hidden by differences at a lower level, in this case by the sociological and demographic characteristics of the students and their parents. This means that differences

between the educational outcomes of the analyzed countries are larger than it seems at first sight, but only if one takes the differences in the sociological and demographic characteristics of the students and their parents into account. But this is a very important observation from the viewpoint of school choice when students and their parents make their choice between the options.

Model 1: without any control.

The first model of Tables 4a shows that students in private independent schools and private government-dependent schools have higher scores in mathematical tests than students at public schools. Furthermore, students in private independent schools have higher scores than students on private government-dependent schools. Although reported in another form, the coefficients of model 1 are analogous to the results in Table 1. However, these differences are not yet a reliable indication of the higher effectiveness of private independent and private government-dependent schools because these schools also have different students and parents, a different composition of their population. In fact, Table 4b shows that these different effects of private independent schools and private government-dependent schools do not vary significantly between countries. The variances of the slopes are not at least twice as large as their standard errors, and thus the variance of the slopes do not significantly deviate from the fixed coefficient at the country level.

Models 2 & 3: controlling for students' and parental characteristics.

In model 2 and 3 we control the effects of private independent schools and private government-dependent schools for the characteristics of students and parents only.

The sociological and demographic characteristics of the students and their parents (model 2 in Tables 4a) do not explain fully the higher scores in math performance of the students in private independent and private government-dependent schools, but these variables explain about half of the original advantages in the mathematical tests of students in private independent schools and private government-dependent schools. Therefore, the differences of these characteristics between schools only partly explain the higher effectiveness of private independent schools and private government-dependent schools.

We will not discuss the effects of all control variables separately, because they are mostly self-evident and because of limitations of space. We will only comment on those results which are contra-intuitive or which give more insight into the possible causes of the higher effectiveness of private independent schools and private government-dependent schools. The effect of parental wealth is significantly negative, but this is only true because we have strong controls for the social and cultural characteristics of the students and their parents. This simply means that high scores in mathematics depends on the social and cultural characteristics of students and their parents (especially educational level), and that family wealth *per se* can be more of a hindrance than an advantage, given these social and cultural characteristics. The parameter of family educational support is negative, which could lead to the strange conclusion that families should not support their children educationally. However, family support measures, among others, how often the student reports that the parents help the student with their homework. This parental help

normally becomes more frequent at the moment when scholastic results are low, and is more or less absent so long as the scholastic results are good. This revised causal direction can explain the negative parameter.

The behavioral and attitudinal characteristics of students and parents related to education and schools (model 3 of tables 4a) do not change the higher scores in the math tests of students in private independent and private government-dependent schools, in comparison to the scores in model 2 (with only sociological and demographic features of the students and their parents as control variables). This does not mean that the behavioral and attitudinal characteristics of students and parents related to education and schools are unimportant for the prediction of the level of scores in the mathematical tests. It only means that they are irrelevant for the explanation of the higher effectiveness of private independent and private government-dependent schools.

The negative sign of the coefficient of teacher support can be explained in the same way as that of family educational support, that is, by a revised causal direction. An increase of help by teachers is often more related to bad scholastic results than to good results. The negative signs of the variables related to school disciplinary climate and achievement pressure will only surprise those who are not familiar with the didactic literature.

The results produced by model 3 can be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, given the different characteristics that individual students and their parents bring to their private and public schools, or develop while attending these schools, after choosing them.

Model 4: controlling for school composition.

In model 4 we control for the social composition of schools. This is a vital step in the assessment of the effects of schools, given that the (self-)selection and allocation processes of schools and parents mean that the social composition of schools will differ strongly. This different social composition will determine partly the opportunities within schools to teach and to learn at a certain level, independently from the individual characteristics of students and parents, because it influences the real time spent on teaching and the level of non-academic disturbances. The results from model 4 show the importance of controlling for social composition of the school in explaining the higher scores in the math performance of students in private independent and private government-dependent schools. In fact, the higher scores in pupils' mathematical tests in private independent schools can be fully explained by the social composition of these schools. In effect, this means that private independent schools are not necessarily more effective in their teaching than public schools, but rather that the former schools attract on the average more children from the higher classes of society (in terms of occupational status, wealth, parental academic interest), which in turn creates a better opportunity structure for learning and teaching. The negative sign for private independent schools in model 4 even suggests that these schools are less effective than public schools with the same social composition – although this negative coefficient is not yet significant (it will become significant in model 6).

The same does not equally hold for private government-dependent schools. The strength of the positive coefficient decreases substantially (by more than 50% from 8.8.

to 3.0) by controlling for social composition of the schools. Although it remains positive but it becomes insignificant.

In model 4 we also control for other compositional characteristics of schools, like the percentage of girls and the location of the school. Although these variables have significant and interesting effects, they are not responsible for the switch of the sign of the coefficient with regard to private independent schools.

The results from model 4 can therefore be interpreted as reliable estimates of the higher effectiveness of both forms of private schools, taking into consideration the characteristics of individual students and their parents bring to their private and public schools or gain by the compositional school characteristics, and which result from the aggregate of school choices of students and parents.

Models 5 & 6: conditions and school climate as explanations.

In the next two models, 5 and 6, we try to explain why students from private independent schools have lower scores for math and students from private government-dependent schools have higher (though not significantly higher) scores for math than students at public schools.[8] The possible explanation of these differences might be the different learning and teaching conditions in these schools (school size; number of schooling hours; student-teacher ratio; instructional resources; shortage of teachers; school autonomy; teacher participation in decision making; material resources – see model 5) and the different school climates of these schools (teacher misbehavior; student misbehavior; teacher morale – see model 6).

Although a number of these conditions affect the test scores, they do not influence the strength of the negative effect of private independent schools, when comparing model 5 to model 4. However, if we add the variables for school climate to the equation in model 6, the effect of private independent schools becomes even more negative (and significant) than in model 4 or 5. This suggests that private independent schools have a better school climate than public schools, but if one take that difference in school climate into account they are even less effective than comparable public schools.

Learning and teaching conditions cannot explain the higher effectiveness of the private government-dependent schools either. The effect of private government-dependent schools becomes stronger in model 5 compared to model 4 but remains insignificant. This suggests that the learning and teaching conditions in private government-dependent school are, on average, less positive than in public schools and even if one takes that difference into account they are not significantly more effective than comparable public schools. However, the effectiveness of the private government-dependent schools can partly be explained by their better school climate. As illustrated in model 6, when the school climate variables are added to the equation, the effect of private government-dependent schools becomes substantially smaller but insignificant (just like in model 4 and 5).

Random variances of slopes.

In Table 4b we can see that the effects of private independent schools and private government-dependent schools did not vary significantly between countries in any of the models. The variance of the slopes is not at least twice as large as their standard errors,

and thus the variance of the slopes does not significantly deviate from the fixed coefficient at the country level. This means that these effects are more or less equal for the 19 countries we have analyzed.

In the last column of Tables 4b we report no significant variance between the slopes of these two dummy variables and the intercepts of the models. This means that ceiling or bottom effects cannot explain the coefficients of these variables in the different models. This result is important for the interpretation of the lower effectiveness of private independent schools, after controlling for students' and parental characteristics and school composition, because it indicates that this lower effectiveness is not a statistical artifact, caused by ceiling effects.

Conclusions

Our analysis shows clearly that private government-dependent schools are more effective than comparable public schools with the same students, parents and social composition, not only for reading (Dronkers & Robert, 2008), but also for math. This is an important finding because while reading performance is less dependent of the school effectiveness and more of the parental capital. We can now be more sure that the results are not the consequence of unmeasured parental cultural capital. The main explanation of this higher effectiveness is the better school climate in the former, in comparison to the latter. The different learning and teaching conditions in private government-dependent and public schools do not explain differences in the effectiveness. This does not mean that private

government-dependent schools do not have a more favorable social composition, and that this does explain fully the higher educational outcomes of their students. Rather, it only means that next to students, parents and social composition, the more favorable school climate does provide the full explanation of the higher educational outcomes of students from private government-dependent schools, both in comparison with public and with private independent schools.

Contrary to this, our analysis also reveals that private independent schools are less effective than public schools with the same students, parents and social composition. However, poorer learning and teaching conditions, or a more negative school climate, cannot explain this lower effectiveness. The main explanation of their initially higher effectiveness is the better social compositions of these schools. This better social composition increases the educational outcomes of the students of these private independent schools significantly above the level of the other schools, as shown in analyses without school composition as a control variable. It might be that this positive effect of better social composition reduces the necessity for private independent schools to increase their effectiveness further, because even with a lower effectiveness their students obtain high levels of educational outcomes thanks to the better social composition of these schools. Also, parents who are willing to pay a substantial fee might not be so concerned whether it is the social composition or the higher effectiveness of these private independent schools, as long as the final scholastic attainment of their child is not substantially lower than they may wish. This also gives these private independent schools teaching and learning time, which can be devoted to the acquisition of qualifications other than the purely scholastic ones like math or reading (for example

team-work, competition, leadership, cultural capital). The greater opportunity of private independent schools to devote teaching and learning time for the acquisition of team-work, competition, leadership or cultural capital can compensate for the smaller progress in scholastic qualification by private independent school pupils compared to the progress of those of public schools.

These effects of private independent and private government-dependent schools are more or less equal in the 19 different OECD countries, despite their different names. Government-dependent private schools can thus include chartered schools in the USA, state granted religious schools in many European societies, but also state granted schools with a particular didactic concept like Montessori.[9] Government independent private schools can thus include religious schools in the USA, religious schools in some European societies, but also schools with a particular didactic or philosophical concept like Anthroposophy (like the Walddorf schools in Germany). This means that none of these countries are exceptional regarding the deviating educational outcomes of their private independent or private government-dependent schools, whatever the historical background and origin of the non-public schools or their current constitutional arrangements (Merrifield, 2007). This also means that the higher effectiveness of the private government-dependent sector does not vary with the largeness of this sector. Their effectiveness in countries like Belgium and the Netherlands with a large proportion of private government-dependent schools is as large as their effectiveness in the US or Italy, with a tiny private government-dependent sector. This 'universal' effect of private independent and private government-dependent schools suggests that these differences in effectiveness may be a consequence of modern post-industrial societies, wherein

education has become a major dimension of inequality, alongside occupation and wealth. In these modern societies school choice and educational 'markets' have become important means for mobility along the education inequality dimension, indifferent for historical and legal nuances and variations.

As said earlier we cannot make the distinction between secular and religious private schools, due to an permanent omission in the PISA data of 2003 and 2006, which is however an important distinction in school choice debates (Merrifield, 2007). We should be able to make this essential distinction, which has proven to be important in earlier research in America and Europe. That would allow us to test whether the higher net scholastic achievement of private government-dependent schools is related either to the religious background of school, teachers and parents or to the private character of the schools. Dutch research (Koopman & Dronkers, 1994) on scholastic achievement differences between secular private government-dependent schools, catholic or protestant government-dependent schools and public schools suggests that students in the former schools have lower scholastic results after accounting for student intake and school composition. Another important future research question would be whether this higher net scholastic achievement of private government-dependent schools is also true for non-cognitive outcomes, like religious and moral attitudes of the pupils. Dronkers (2004) reports that religious schools in Europe were only more effective in cognitive but not in affective outcomes. If this outcome was confirmed cross-nationally, it would shed light on the increasing popularity of religious schools and school choice in secularized societies such as France and the Netherlands, but also in the USA.

The multi-level analyses presented here do not allow to separate fully the consequences of parental school choice and the consequences of school effectiveness. Two different processes can be only distinguished by the different models of the multi-level analysis, while it remains debatable what is the consequence of school choice and what of school effectiveness. In future analyses we need more precise and separate analyses of school choice processes in various nations (which might still be very different dependent on the constrains and opportunities of the educational local markets) and of the effectiveness differences between private dependent and public schools (which might be invariant between nations). Student mobility between private and public schools can be better incorporate in such separate analyses of school choice and school effectiveness processes.

References

Bourdieu, P. (1983). The Forms of Capital. In J. Richardson (ed.), *Handbook of Theory and Research for the Sociology of Education.* New York: Greenwood Press.

Bryk, A. S., Lee, V. E. & Holland, P. B. (1993). *Catholic schools and the common good.* Cambridge (Mass.)/ London: Harvard University Press.

Corten, R. & Dronkers, J. (2006). School Achievement of Pupils From the Lower Strata in Public, Private Government-Dependent and Private Government-Independent Schools: A cross-national test of the Coleman-Hoffer thesis. *Educational Research and Evaluation* 12:179-208.

Coleman, J. S., Hoffer, T. B. & Kilgore, S. (1982). *High school achievement: Public, Catholic, and other private schools compared.* New York: Basic Books.

Coleman, J. S. & Hoffer, T. (1987). *Public and private high schools. The impact of communities*. New York: Basic Books.

DiMaggio, P. (1982). Cultural Capital and School Success: The Impact of Status Culture Participation on the Grades of U.S. High School Students. *American Sociological Review*, 47, 189-201.

Dronkers, J., (2004). Do Public and Religious Schools Really Differ? Assessing the European Evidence. pp. 287-314 in *Educating Citizens. International Perspectives on Civic Values and School Choice*, edited by P. J. Wolf & S. Macedo. Washington DC: Brookings Institution Press.

Dronkers, J. & Robert, P. (2008) Differences in Scholastic Achievement of Public, Private Government-Dependent, and Private Independent Schools: A Cross-National Analysis. *Educational Policy* 22, 541-577.

Ganzeboom, H. B. G., Graaf, P. de, Treiman, D. J. & De Leeuw, J. (1992). A standard international socio-economic index of occupational status. *Social Science Research*, 21, 1-56.

Hofman, R. H. (1993). *Effectief schoolbestuur. Een studie naar de bijdrage van schoolbesturen aan de effectiviteit van basisscholen*. [Effective school administration. A study on the contributions of school boards to school effectiveness]. Groningen: RION.

Hox, J. (2002). *Multivariate Analysis. Techniques and Applications*. Mahwah (NJ)/ London: Lawrence Erlbaum.

Koopman, P. & Dronkers, J. (1994). De effectiviteit van algemeen bijzondere scholen in het algemeen voortgezet onderwijs. [The effectiveness of neutral private schools in the general secondary education] *Pedagogische Studiën* 71: 420-441.

Merrifield, J. (2007). The Twelve Ways to Exercise or Facilitate School Choice. *Journal of School Choice* 2: 1

OECD (1999). *Classifying educational programmes. Manual for ISCED97 implementation for OECD countries*. Paris: OECD.

Rasbash, J., Browne, W., Goldstein, H., Yang, M., Plewis, I., Healy, M., Woodhouse, G., Draper, D., Langford, I. & Lewis, T. (2000). *A user's guide to MLwiN 1.1*. London: Institute of Education, University of London.

Sammons, P., Hillman, J. & Mortimore, P. (1995). *Key characteristics of effective schools: A review of school effectiveness research.* London: Office for Standards in Education and Institute of Education.

Scheerens, J. & Bosker, R. (1997*). The Foundations of Educational Effectiveness.* Kidlington/New York/Toyko: Pergamon.

Teddlie, C. & Reynolds, D. (2000). *The international handbook of school effectiveness research.* London: Falmer.

Vandenberghe, V. & Robin, S. (2004). "Evaluating the effectiveness of private education across countries: a comparison of methods" *Labour Economics* 11: 487-506.

Warm, T. A. (1985). *Weighted maximum likelihood estimation of ability in Item Response Theory with tests finite length*. Oklohama City: US Coast Guard Institute.

Table 1: Dependent variable: Means of the math scores as well as of their error terms, by type of schools (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
Math score	546.5* (92.4)	528.0* (92.7)$	503.8 (96.2)	508.8 (96.2)
Error term of math score	42.3* (13.5)$	41.6* (13.3)$	43.5 (16.3)	43.1 (15.8)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 2: Percentages of students and, between parentheses, the absolute number of schools by type of school and country

Countries	Type of school			N of cases
	Private independent	Private government-dependent	Public	
Austria	6.1% (7)	5.7% (7)	88.2% (107)	1985 (121)
Belgium	0.5% (1)	74.7% (138)	24.8% (49)	3352 (188)
Czech Republic	-	4.7% (7)	95.3% (144)	2430 (151)
Denmark	-	21.3% (28)	78.7% (102)	1620 (130)
Finland	-	2.8% (4)	97.2% (146)	2629 (150)
France	8.0% (11)	14.2% (21)	77.8% (107)	2170 (139)
Germany	-	4.9% (7)	95.1% (143)	2068 (150)
Hungary	0.6% (1)	4.4% (6)	95.0% (133)	2488 (140)
Ireland	2.8% (4)	61.8% (77)	35.4% (48)	2001 (129)
Italy	3.4% (5)	0.6% (1)	96.0% (135)	2420 (141)
Netherlands	-	76.1% (62)	23.9% (20)	1164 (85)
New Zealand	4.1% (5)	-	95.9% (123)	1748 (128)
Poland	1.8% (2)	-	98.2% (110)	1796 (112)
Portugal	1.8% (2)	5.5% (7)	92.7% (120)	2254 (129)
Spain	8.4% (13)	29.2% (46)	62.4% (104)	2963 (163)
Sweden	-	3.3% (5)	96.7% (136)	2317 (141)
Switzerland	2.9% (5)	1.8% (3)	95.3% (138)	2358 (146)
United Kingdom	5.0% (14)	-	95.0% (284)	4151 (298)
USA	3.6% (3)	1.3% (1)	95.1% (83)	1292 (87)
Total	2.7% (73)	15.9% (420)	81.4% (2232)	43607 (2725)

Table 3a: Independent variables 1.: Means of social characteristics of the students and of their parents by type of school (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
Male	0.49 (0.5)	0.47* (0.5)	0.5 (0.5)	0.49 (0.5)
School grade	9.9* (0.8)	9.6 (0.6)$	9.6 (0.8)	9.6 (0.8)
Age (in months)	189.0* (3.5)	188.5 (3.5)	188.5 (3.4)	188.5 (3.4)
Father's ISEI	54.9* (17.3)$	45.9* (16.3)$	43.6 (15.4)	44.3 (15.7)
Mother's ISEI	50.4* (15.4)$	43.4* (14.7)	43.0 (14.5)	43.2 (14.6)
Father's education	5.0* (1.2)	4.5* (1.4)$	4.3 (1.3)	4.4 (1.3)
Mother's education	4.8* (1.3)	4.4* (1.4)$	4.3 (1.3)	4.3 (1.3)
Number of siblings	1.5* (1.1)$	1.8* (1.3)	1.8 (1.3)	1.8 (1.3)
Family structure				
- Single parent family	0.15 (0.35)$	0.12* (0.33)$	0.16 (0.37)	0.15 (0.36)
- Nuclear family	0.78* (0.41)$	0.8* (0.4)$	0.74 (0.44)	0.75 (0.43)
- Mixed parent family	0.05* (0.21)$	0.06* (0.24)$	0.07 (0.26)	0.07 (0.25)
- Other family type	0.02 (0.15)	0.02* (0.14)$	0.03 (0.16)	0.03 (0.16)
Parental academic interest	0.41* (0.90)	-0.09* (1.01)$	0.02 (0.95)	0.01 (0.97)
Parental social interest	0.24* (0.94)	0.03* (0.97)$	0.07 (0.98)	0.07 (0.98)
Students cultural activities	0.43* (1.01)	0.04 (0.96)$	0.04 (.099)	0.05 (.099)
Family cultural possession	0.46* (0.89)$	-0.12* (1.00)$	-0.03 (0.99)	-0.03 (0.99)
Family wealth	0.55* (0.93)	0.03* (0.82)$	-0.02 (0.95)	0.00 (0.94)
Family educational support	0.01 (0.98)	-0.14* (0.97)	0.03 (0.98)	0.00 (0.98)
Home educational resources	0.30* (0.79)$	0.19* (0.88)$	0.07 (0.94)	0.09 (0.93)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 3b: Independent variables 2.: Means of behavioral and attitudinal characteristics of students and of their parents by type of school (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
Time spent on homework	0.26* (0.93)	0.07* (0.92)$	-0.01 (0.93)	0.01 (0.93)
Teacher support	0.16* (1.03)$	-0.11* (0.96)	0.00 (0.98)	-0.01 (0.98)
Teacher-student relationship	0.26* (1.02)$	0.01* (0.91)$	-0.01 (0.97)	0.01 (0.96)
School disciplinary climate	-.20* (1.06)$	0.01* (1.01)	-0.00 (0.99)	0.00 (1.00)
Achievement pressure	0.08* (1.05)$	-0.09* (1.00)$	0.02 (0.98)	0.00 (0.98)
Sense of belonging in the school	0.09 (1.04)$	-0.05* (0.94)$	0.03 (0.97)	0.02 (0.097)
Enjoyment of reading	0.14* (1.08)$	-0.08* (1.01)$	0.00 (1.00)	-0.01 (1.01)
Reading diversity	0.10* (0.92)$	-0.09* (1.02)$	-0.02 (0.97)	-0.03 (0.98)
Time in minutes spent reading per week	203.0* (55.6)$	192.2* (59.1)$	196.0 (82.1)	195.6 (78.3)
Time in minutes spent in maths class per week	194.5* (54.0)$	188.5* (63.4)$	183.6 (66.7)	184.6 (65.9)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 3c: Independent variables 3.: Means of measures for social composition of the school population by type of school (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
% of girls in the school	47.7* (28.3)$	51.4* (26.5)$	49.7 (18.1)	49.9 (20.0)
School average: Father's ISEI	53.9* (8.3)$	45.9* (7.4)$	43.6 (7.0)	44.3 (7.3)
School average: Family wealth	0.55* (0.48)$	0.03* (0.40)$	-0.02 (0.57)	0.00 (0.55)
School average: Parental academic interest	0.41* (0.34)$	-0.09* (0.41)$	0.02 (0.36)	0.01 (0.38)
Location of the school				
- capital city	0.10* (0.30)$	0.05 (0.23)$	0.05 (0.21)	0.05 (0.22)
- big city (> 1.000.000)	0.13* (0.34)$	0.02* (0.14)$	0.05 (0.22)	0.05 (0.22)
- city (100.000-1.000.000)	0.35* (0.48)$	0.21* (0.40)$	0.17 (0.37)	0.18 (0.38)
- town (15.000-100.000)	0.19* (0.4)$	0.42* (0.49)$	0.37 (0.48)	0.38 (0.48)
- small town (3.000-15.000)	0.11* (0.31)$	0.21* (0.41)$	0.27 (0.44)	0.25 (0.44)
- village (< 3000)	0.12* (0.32)$	0.09 (0.28)	0.09 (0.28)	0.09 (0.28)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 3d: Independent variables 4.: Means of indicators for teaching and learning conditions in the school by type of school (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
School size: N of students in school	666* (357)$	712* (420)$	694 (435)	696 (431)
Total number of schooling hours per year	983.9* (151.1)$	991.1* (109.1)$	943.4 (138.6)	952.1 (136.0)
Total number of computers per school size	0.13 (0.14)$	0.10* (0.09)$	0.13 (0.13)	0.12 (0.12)
Number of students per teacher	13.4* (4.5)$	13.3* (4.3)$	12.8 (4.7)	12.9 (4.6)
Teaching resources	-0.73* (0.87)	-0.24* (0.96)	-0.08 (0.96)	-0.13 (0.97)
Shortage of teachers	-0.69* (0.65)$	-0.16* (0.85)$	-0.09 (0.92)	-0.11 (0.90)
School autonomy	0.68* (0.96)$	0.31* (0.68)$	-0.02 (0.98)	0.05 (0.95)
Teacher participation in decision making	0.25* (0.72)$	0.19* (0.88)	0.15 (0.88)	0.16 (0.86)
Material resources	-0.66* (0.75)$	-0.34* (0.87)$	-0.06 (0.95)	-0.13 (0.95)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 3e: Independent variables 5.: Means of indicators for school climate by type of school (standard deviation in parentheses)

School type	Private independent	Private government-dependent	Public	Total
Teacher misbehavior	-0.84* (0.96)$	-0.13* (1.00)$	-0.01 (0.9)	-0.05 (0.93)
Student misbehavior	-0.88* (0.96)$	-0.29* (1.04)$	0.04 (0.89)	-0.04 (0.93)
Teacher morale	0.39* (1.03)$	0.06* (0.89)$	-0.08 (0.95)	-0.05 (0.95)

* Significant differences of mean compared to public schools (t-test with unequal variances; $p < 0,05$); $ significant difference of standard deviation compared to public schools (Levene's test; $p < 0,05$).

Table 4a: The fixed coefficients of nested multilevel equations with mathematics score as the dependent variable (standard error between parentheses)

	0	1	2	3	4	5	6
Constant	514.1 (5.5)	510.2 (5.3)	302.0 (19.1)	291.2 (18.8)	211.1 (19.4)	212.1 (20.0)	231.0 (20.0)
Private independent		41.1 (5.3)	20.7 (4.1)	20.0 (3.9)	-7.4 (3.7)	-7.1 (3.8)	-9.0 (3.7)
Private government-dependent		17.5 (3.1)	9.3 (2.4)	8.8 (2.3)	3.0 (2.1)	3.6 (2.1)	1.6 (2.0)
Public		Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Students School Grade			33.5 (.7)	32.6 (.7)	31.5 (.7)	31.4 (.7)	31.3 (.7)
Male			14.7 (.7)	18.8 (.7)	19.3 (.7)	19.3 (.7)	19.3 (.7)
Mother's ISEI*10			3.2 (.3)	3.2 (.3)	3.0 (.2)	3.0 (.2)	3.0 (.2)
Father's ISEI*10			3.2 (.3)	3.0 (.2)	2.2 (.3)	2.2 (.3)	2.2 (.3)
Age in months			-.9 (.1)	-.9 (.1)	-.8 (.1)	-.8 (.1)	-.8 (.9)
Number of siblings			-2.1 (.3)	-2.3 (.3)	-2.0 (.3)	-2.0 (.3)	-2.0 (.3)
Father's education			1.8 (.3)	1.5 (.3)	1.3 (.3)	1.3 (.3)	1.3 (.3)
Mother's education			2.6 (.3)	2.5 (.3)	2.3 (.3)	2.3 (.3)	2.2 (.3)
Family wealth			-.5 (.4)	.5 (.4)	-.3 (.4)	-.3 (.4)	-.3 (.4)
Parental academic interest			5.5 (.4)	3.2 (.4)	2.7 (.4)	2.8 (.4)	2.7 (.4)
Parental social interest			-1.2 (.4)	-1.6 (.4)	-1.5 (.4)	-1.5 (.4)	-1.5 (.4_
Students' cultural activities			4.1 (.4)	1.8 (.4)	1.4 (.4)	1.4 (.4)	1.4 (.4)
Family cultural possessions			3.3 (.4)	1.8 (.4)	1.6 (.4)	1.6 (.4)	1.5 (.4)
Family educational support			-11.0 (.4)	-11.1 (.4)	-10.8 (.4)	-10.8 (.4)	-10.8 (.4)
Home educational resources			8.8 (.4)	8.0 (.4)	8.0 (.4)	8.0 (.4)	8.0 (.4)
Nuclear family			Ref.	Ref.	Ref.	Ref.	Ref.
Single parent family			-8.6 (.9)	-7.0 (.9)	-7.2 (.9)	-7.2 (.9)	-7.1 (.9)
Mixed parent family			-6.1 (1.3)	-5.9 (1.3)	-5.8 (1.3)	-5.8 (1.3)	-5.6 (1.3)
Other family type			-21.1 (2.1)	-20.2 (2.1)	-20.3 (2.1)	-20.2 (2.1)	-20.2 (2.1)
Time spent on homework				1.6 (.4)	1.4 (.4)	1.4 (.4)	1.3 (.4)
Teacher support				-2.7 (.4)	-2.7 (.4)	-2.7 (.4)	-2.7 (.4)
School disciplinary climate				-.4 (.4)	-.4 (.3)	-.4 (.3)	-.3 (.3)

Achievement pressure				-2.3 (.3)	-2.2 (.3)	-2.1 (.3)	-2.2 (.3)
Teacher-student relationship				2.9 (.4)	3.0 (.4)	3.0 (.4)	3.0 (.4)
Sense of belonging in the school				.4 (.3)	.3 (.3)	.3 (.3)	.3 (.3)
Enjoyment of reading				8.3 (.4)	8.1 (.4)	8.1 (.4)	8.1 (.4)
Reading diversity				4.9 (.4)	5.0 (.4)	5.0 (.4)	4.9 (.4)
Time in minutes spent in maths class per week *100				5.5 (.6)	5.5 (.6)	5.5 (.6)	5.4 (.6)
School average: Father's ISEI					1.7 (.1)	1.7 (.1)	1.4 (.1)
School average: Family wealth					14.2 (2.0)	13.9 (2.0)	12.1 (2.0)
School average: Parental academic interest					13.7 (2.0)	13.7 (2.0)	12.1 (2.0)
School in Capital city					Ref.	Ref.	Ref.
School in city >1.000.000					-3.3 (3.5)	-4.0 (3.5)	-5.2 (3.4)
School in city 100.000-1.000.000					5.2 (2.9)	4.9 (2.9)	3.8 (2.8)
School in town 15.000-100.000					12.5 (2.7)	12.6 (2.7)	10.0 (2.6)
School in small town 3.000-15.000					15.4 (2.8)	16.3 (2.8)	13.3 (2.8)
School in village < 3.000					17.7 (3.2)	18.7 (3.2)	13.5 (3.1)
% of girls in school					4.6 (3.0)	4.1 (3.0)	.9 (2.9)
School size*100						.5 (.2)	.6 (.2)
Total number of schooling hours per year *100						.4 (.4)	.3 (.4)
Total number of computers per school size						.1 (4.9)	1.7 (4.8)
Number of students per teacher*10						-3.2 (1.6)	-4.5 (1.5)
Instructional resources						-1.6 (.7)	-1.0 (.7)
Shortage of teachers						-2.5 (.7)	-1.4 (.7)
School autonomy						-.3 (.9)	-.4 (.9)
Teacher participation to decision making						-.1 (.7)	-.1 (.7)
Material resources						.6 (.7)	1.3 (.7)
Teacher misbehavior							3.9 (.8)
Student misbehavior							-10.2 (.8)

Teacher morale							1.4 (.7)
Variance at country level	556 (185)	504 (169)	780 (256)	705 (231)	642 (211)	676 (222)	680 (223)
Variance at school level	1717 (55)	1656 (53)	890 (31)	812 (29)	578 (23)	567 (22)	516 (21)
Variance at student level	2905 (32)	2904 (32)	2375 (28)	2271 (27)	2267 (27)	2267 (27)	2267 (27)
2*log likelihood	502381	502297	495611	494362	493619	493582	493402

Table 4b: The random coefficients and their variances of the private independent schools and private government-dependent schools variables at country level (with public schools reference), in the different models of mathematical scores (standard error between parentheses).

	Model	-2*log likelihood	coefficient	variance slope	covariance intercept & slope
Private independent	1	502292	37.3 (8.3)	409.7 (323.8)	-43.7 (188.7)
Private independent	2	495607	16.4 (5.2)	130.0 (132.5)	-218.4 (155.8)
Private independent	3	494358	15.6 (5.3)	145.6 (135.3)	-201.2 (148.8)
Private independent	4	493615	-11.0 (4.8)	118.3 (107.6)	-177.8 (126.6)
Private independent	5	493579	-10.8 (4.8)	113.3 (103.9)	-194.5 (128.5)
Private independent	6	493398	-12.9 (4.8)	131.2 (107.3)	-223.4 (131.5)
Private government-dependent	1	502293	14.7 (4.4)	97.7 (91.7)	-10.3 (100.8)
Private government-dependent	2	495609	7.9 (3.2)	48.9 (50.1)	4.4 (91.4)
Private government-dependent	3	494360	7.4 (3.0)	40.1 (43.7)	-8.8 (82.0)
Private government-dependent	4	493616	1.9 (2.9)	41.6 (39.2)	-4.2 (72.7)
Private government-dependent	5	493580	2.4 (2.8)	34.3 (35.3)	-17.7 (71.5)
Private government-dependent	6	493400	-.1 (2.8)	35.8 (34.9)	51.3 (70.3)

APPENDIX

Table A1: Means and standard deviations for reading and math scores by type of school and countries

Country	School type	Math score	
		Mean	Standard deviation
Austria	Private independent	527.5	84.5
	Private gov. dependent	534.4	85.3
	Public	516.0	89.4
Belgium	Private independent	555.8	87.3
	Private gov. dependent	540.1	94.5
	Public	491.6	105.0
Czech Republic	Private independent	-	-
	Private gov. dependent	483.6	77.5
	Public	509.2	95.4
Denmark	Private independent	-	-
	Private gov. dependent	525.1	90.5
	Public	515.0	85.6
Finland	Private independent	-	-
	Private gov. dependent	538.7	94.2
	Public	533.5	82.5
France	Private independent	535.4	82.4
	Private gov. dependent	513.0	100.1
	Public	511.6	94.2
Germany	Private independent	-	-
	Private gov. dependent	552.9	74.2
	Public	509.9	95.5
Hungary	Private independent	376.4	70.7
	Private gov. dependent	504.8	108.0
	Public	490.6	94.4
Ireland	Private independent	562.4	70.1
	Private gov. dependent	509.3	82.4
	Public	488.2	88.0
Italy	Private independent	480.5	74.4
	Private gov. dependent	380.8	97.5
	Public	461.2	93.0
Netherlands	Private independent	-	-
	Private gov. dependent	570.6	86.3
	Public	558.3	98.1
New Zealand	Private independent	591.7	85.3
	Private gov. dependent	-	-
	Public	535.8	95.7
Poland	Private independent	564.9	72.2

	Private gov. dependent	-	-
	Public	466.1	98.2
Portugal	Private independent	533.0	78.9
	Private gov. dependent	474.3	81.5
	Public	464.1	89.7
Spain	Private independent	524.1	87.6
	Private gov. dependent	496.9	84.4
	Public	467.2	93.0
Sweden	Private independent	-	-
	Private gov. dependent	505.8	84.6
	Public	509.2	94.0
Switzerland	Private independent	549.0	85.6
	Private gov. dependent	565.3	64.1
	Public	535.0	98.1
United Kingdom	Private independent	613.5	79.2
	Private gov. dependent	-	-
	Public	525.0	89.6
USA	Private independent	526.3	88.0
	Private gov. dependent	519.5	78.1
	Public	486.4	92.6

Notes

[1] The content and structure of this data is summarized as follows on the OECD's website: "From this page you can download the PISA 2000 dataset with the full set of responses from individual students and school principals. These files will only be of use to statisticians and professional researchers who would like to undertake their own analysis of the PISA 2000 data. The files available on this page include the questionnaires, the data files, the codebooks as well as SAS and SPSS control files in order to process the data."

[2] Not only in the PISA 2000 data, but also in the newer data sets (2003; 2006).

[3] PISA 2003 focus on mathematical literacy and PISA 2006 on scientific literarcy., while the other scholastic achievement were of secondary importance in these waves.

[4] We would like to refer to our other analysis at this point on the same PISA data where the dependent variable is the reading score (Dronkers & Robert 2008).

[5] In fact, age is taken as a serious explanatory variable for students' performance even if the grade of the target population was defined in a narrow way (15 years old). This is why a very precise measure of age in month is applied in the data, and only a three-month testing window was allowed for the data collection in the countries in order to ensure the accuracy of students' age at the time of assessment.

[6] Percentages in Table 2 are unweighted. Weighted percentages (when applied the student weight as provided with the PISA dataset and described in the documentation) result in slightly different distributions, but the pattern with respect to the school types basically does not change. Weighted percentages produce even higher share of students in public sphere and the proportion of students in the private, government dependent institutions is smaller. The national deviations from the main average display the same picture.

[7] As a combination of Table 1 and Table 2, Table A1 (in the Appendix) displays the mean and standard deviation of the math scores by type of school and country. It seems that the declining trend in the mean of the math scores from private independent schools to public schools, as well as the increasing trend in the standard deviation of the math scores from private independent schools to public schools, is present for most of the different nations. Even if there are deviations from this trend in certain countries, these deviations do not seem to be related to the variation of the private – public sector distribution in the given countries.

[8] For reading, students from private government-dependent schools had significantly higher scores than students at public schools (Dronkers & Robert 2008).

[9] The characterization of USA charters school is made by the PISA authorities, in consultation with the USA data collector. This characterization is consistent with that of comparable schools in other European nations. The fact that USA charter schools are bound by numerous regulatory requirements by the chartering authorities make them private dependent schools, but not yet public. The same holds for comparable schools in Europe, which are also subjected to

numerous regulatory requirements by their chartering authorities. For instance, private dependent schools in the Netherlands, France and Germany are forbidden to charge substantial fees, if they receive substantial state grants.